STANDARD

PROCEDURE

G-6020 a)

PROGRAM: Standard Work Aids

PROJECT: Work Breakdown Structure (WBS)

SUBJECT: Uniform WBS for NASA AMES - CFG

Authorized by: _____
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Dated on _____

Total Pages 9

1.0 PURPOSE

1.1 The purpose for the use of this procedure is to reduce the confusion that can exist when defining, managing and monitoring projects at NASA Ames CFG Branch. Our goal is to provide consistency and repeatability for our work efforts and to work towards defining and retaining our Best Practices so that we can repeat them in the future.

2.0 SCOPE

2.1 Ames Research Center Work Breakdown Structures for cost analysis.

3.0 REFERENCES OR REFERENCE DOCUMENTS

3.1 **Cost/Schedule Control Systems Criteria,** Quentin W. Fleming, Probus Publishing Co Chap 9 Work Breakdown Structure pgs. 77-92

3.2 **PMBOK Guide (2000 Edition)** Project Management Institute – Definitions

4.0 DEFINITIONS AND ACRONYMS

4.1 **Component** – A constituent part, an element.

4.2 **Deliverable** – Any measurable, tangible, verifiable outcome, result, or item that must be produced to complete a project or part of a project. Often used more narrowly in reference to an external deliverable, which is a deliverable that is subject to approval by the project sponsor or customer.

4.3 **Element** – One of the parts, substances, or principles that make up a compound or complex whole.

4.4 **FCS** – Financial Coding Structure, a generic term used by the authors of this procedure to be used in lieu of the "IFM WBS Coding Structure" terminology referred to by the IFMP (Integrated Financial Management Program). It's purpose is to lessen the confusion caused by two different disciplines (financial management and project management) when making reference to their elements.

4.5 **Level 1** - The entire material item, project or system

4.6 **Level 2** - Major Subsections of the total project

4.7 **Level 3** - Elements subordinate to Level 2 major subsections

4.8 **Level 4** -Work Packages

4.9 **Level 5** – Tasks

4.10 **Milestones** - a significant event in a project, usually a completion of a major deliverable.

4.11 **NASA Structure Management (NSM)-** NASA Structure Management (NSM) is the new data coding structure utilized by the Agency. NSM encompasses both the Programmatic Hierarchy and the Institutional Hierarchy (while adhering to the same Financial WBS at all levels). This data coding structure began October 1, 2005.

4.12 **Program** – A group of related projects managed in a coordinated way. Programs usually include an element of ongoing work.

4.13 **Project** – a temporary endeavor undertaken to create a unique product, service or result.

4.14 **Subproject** – A smaller portion of the overall project

4.15 **Task** – A generic term for work that is not included in the work breakdown structure, but potentially could be a further decomposition of work by the individuals responsible for that work. Also, lowest level of effort on a project.

4.16 **UPN** – Unique Project Number – Fund Control Subsection of the NASA WBS. This was in use prior to the implementation of the NSM (October 1, 2005).

4.17 **Work Breakdown Structure (WBS)** – A deliverable-oriented grouping of project elements that organizes and defines the total work scope of the project. Each descending level represents an increasingly detailed definition of the project work.

4.18 **Work Package** – A deliverable at the lowest level of the work breakdown structure when that deliverable may be assigned to another project manager to plan and execute. This may be accomplished through the use of a subproject where the work package may be further decomposed into tasks, sub-tasks and secondary sub-tasks.

5.0 RESPONSIBILITIES

5.1 The WBS Structure and format is mandatory. The Project Manager is responsible for implementing a deliverable-oriented grouping of project elements that organizes and defines the total work of scope of his or her project. While doing so, each descending level represents an increasingly detailed definition of the project work.

6.0 METHODS, METHODOLOGIES, OR SPECIFICATIONS

6.1 A Work Breakdown Structure (WBS) is designed to be a deliverable-oriented grouping of project elements which organize and define the total scope of a project. Each descending level represents an increasingly detailed definition of a project component.

6.2 The goal of this approach is to provide consistency and repeatability across all levels of our organization so that there is less room for misunderstandings. A process that has been used successfully is as follows:

- Step One: Divide the project into its major objectives such that the project is fully defined by the objectives.
- Step Two: Partition each objective into the activities that must be completed in order to accomplish the objective.
- Step Three: For each activity having one or more missing characteristics divide that activity into the sub-activities that comprise it.
- Step Four: Repeat Step 3 until all sub-activities have the characteristics desired.
- Step Five: The lowest-level sub-activities in the hierarchy will be the basis of the work packages that must be completed in order to finish the project.

7.0 FLOW CHARTS/MAPS

7.1 WBS RELATIONSHIPS

7.1.1 These relationships are designed to be uniform within our projects. The first three levels of a full WBS represent the Summary WBS (being referred to as a scheduling term), and they consist of the following:

7.1.1.1 Level 0 – For purposes of communication, Level 0 is defined as the originating Level which will begin with the title of the Program. (Note: Programs consist of projects and subprojects)
7.1.1.2 Level 1 - The entire material item, project or system
7.1.1.3 Level 2 – Major Subsections of the total project
7.1.1.4 Level 3 – Elements subordinate to Level 2 major subsections
7.1.1.5 Level 4 – Work Packages
7.1.1.6 Level 5 – Tasks
7.1.1.7 Level 6—Sub-Tasks
7.1.1.8 Level 7 – Secondary Sub-Tasks

7.2 Note that as October 1, 2005 we have a new data coding structure that replaces our old financial coding structure. This new structure is referred to as the NASA Structure Management (NSM) system and is utilized by the entire Agency.

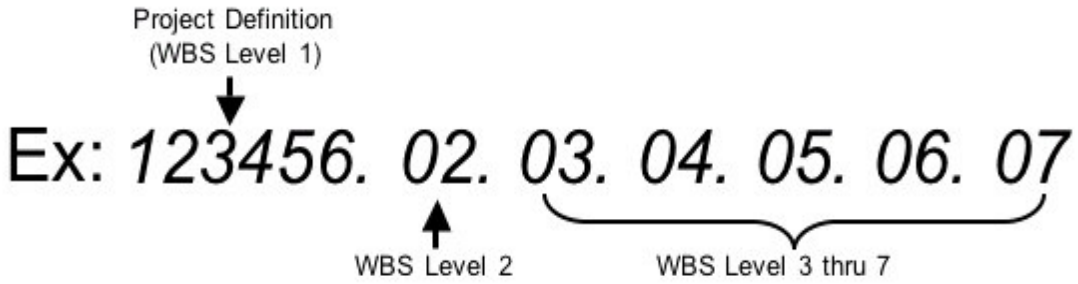
7.3 The following is NASA Structure Management Reprint of URL http://ifmp.arc.nasa.gov/pmi2-nsm.html which provides information on the Structure Format, Programmatic Hierarchy Element, the Institutional Hierarchy Element, the SAP Data Elements and Nomenclature Examples.

NASA Structure Management (NSM)

The NASA Structure Management (NSM) is the new data coding structure utilized by the Agency. NSM encompasses both the Programmatic Hierarchy and the Institutional Hierarchy (while adhering to the same Financial WBS at all levels).

1. The Programmatic Hierarchy represents Projects managed by the Mission Directorates
2. The Institutional Hierarchy represents projects under Corporate G&A, Working Capital Fund (WCF), Institutional Investment (CoF), Agency Service Pools, Center Service Pools, and Center G&A

WBS Structure Format



- All 24 characters are numeric only!
- Design will accommodate up to Level 7 of the Technical WBS
- Project Definition WBS Level 1 is a 6 digit random numeric number project code generated via Meta Data Manager (MdM) (see What is MDM?) system
- Financial activity will occur only at the lowest levels within WBS structure

- WBS Level 2 is the lowest Optional Fund Center in PY06 at the discretion of Agency Program/Project Manager

- SAP R/3 and Business Warehouse Project Systems reports will be modified to include Business Area to support center specific financial views

NSM WBS Examples:
Programmatic Direct, Service Pool, Center G&A, Reimbursable (ppt)

NSM WBS Structure Advantages

- Hierarchical WBS Structure is not duplicated for each Center
- Center is not designated in the WBS nomenclature and is represented at the appropriate level throughout the WBS Hierarchy
- No re-design of WBS structure required during Phase II and III
- Supports EVM Phase II and III requirements
- Supports reporting by summary level task
- Use of 3-digit per level in WBS levels 2-7 is consistent with Project Management Practice
- No significant system performance impact for processing and reporting

Programmatic Hierarchy Element	Description	Institutional Hierarchy Element
Appropriation	• Funding provided to NASA from Congress	**Appropriation**
Mission	• A major activity required to accomplish an Agency goal or to effectively pursue a scientific, technological, engineering opportunity directly related to an Agency goal	**Mission Equivalent**
Theme	• Standard organizing element that is used to articulate mission needs	**Theme Equivalent**
Program	• A strategic investment by a Mission Directorate (or Mission Support Office) that has defined goals, objectives, architecture, funding level, and a management structure that supports one or more projects	**Program Equivalent**
Project	• A specific investment identified in a Program Plan having defined goals, objectives, requirements, lifecycle cost, a beginning, and an end • Yields new or revised products or services that directly address NASA's strategic needs	**Project Equivalent**
Project by Center		**Project Equivalent by Center**
WBS Lower Levels		**WBS Lover Levels**

Summary of NSM Data Elements Table

The below table provides NSM and associated SAP Data Elements, a description of the underlying logic for each appropriate data element nomenclature, and an example of the nomenclature:

NSM Data Elements	SAP Data Elements	Nomenclature	Nomenclature Example
Appropriation	Fund	3-digit Appropriation Type, 2-digit Year of Availability, 4-digit Program Year, 1-digit Fund Type	Fund: EXCX22006D
Mission / Mission Equivalent	Funds Center	4-digit smart coded alphanumeric	Fund Center: ESMD
Theme / Theme Equivalent	Funds Center	2-4 digit smart coded alphanumeric (use existing value when applicable)	Fund Center: AERO
Program / Program Equivalent	Funds Center Functional Area	4-digit random alphanumeric with at least one alpha	Fund Center: 987D Functional Area: 987D
Direct Programmatic Project	Project Definition / Project WBS Funds Center	6-digit random numeric number with 3-digit per WBS level (include period delimiter) – Up to 7 levels	Project Definition: 379041 WBS: 379041.02.03.04.05.06.07 Funds Center: 379041 Funds Center by Center: 62-379041
Institutional Project Equivalent	Project Definition / Project WBS Funds Center	6-digit random numeric number with 3-digit per WBS level (include period delimiter) – Up to 7 levels	Project. Definition: 987654 WBS: 987654.01.03.04.05.06.07 Funds Center: 987654 Funds Center by Center: 51-987654
Reimbursable Project	Project Definition / Project WBS Funds Center	6-digit random numeric number (different from Benefiting Project) with 3-digit (including period delimiter), 4-digit numeric Customer Purchase Order plus 2-digit numeric Fund designation at WBS 2 - 4	Project Definition: 249031 WBS: 249031.01.9876.03 Funds Center: 249031 Funds Center by Center: 22-249031

Funds Center – Budgeting Object
Project Definition – Project Summary Level
Project WBS – Cost Object
Fund – Appropriation by Program Year
Functional Area – Budgeting Object equal to NASA Program

7.4 VISUAL AID TO REFLECT CONVENTIONAL PRODUCT-ORIENTED WORK BREAKDOWN STRUCTURE (WBS)

AGENCY THEME (Aeronautics- [AERO])
AGENCY PROGRAM TITLE (Vehicle Systems) Level 0
PROJECT/ SUBPROJECT CENTER NAME (Vehicle Systems - Ames) Level 1 (WBS 1.0 or 1.) [123456]
DELIVERABLE(S) -[PRODUCT LINE] (Autonomous Robust Avionics) Level 2 (WBS 1.1.) [123456.02]
COMPONENT(S)- CENTER UNIQUE NUMBERING STARTS HERE (Autonomous Vehicle Operations) Level 3 (WBS 1.1.1.) [123456.02.03]
WORK PACKAGE(S) (Vehicle Operations Requirements Document) Level 4 (WBS 1.1.1.1.) [123456.02.03.04]
TASK(S) (Analyze Current Environment) Level 5 (WBS 1.1.1.1.1) [123456.02.03.04.05.]
SUB-TASK(S) (Analyze Current Sub-Environment A) Level (WBS 1.1.1.1.1.1) [123456.02.03.04.05.06]
SECONDARY SUB-TASK(S) LEVEL (Analyze Current Sub-Environment A-1) Level (WBS 1.1.1.1.1.1.1) [123456.02.03.04.05.06.07]
DELIVERABLE(S) COMPLETED (Completion is the Milestone) 

7.5 In the event there are major deliverables that by necessity have to be tracked separately, because they are defined after the PROJECTS are defined, we are to track them as the generic equivalent of CONVENTIONAL PRODUCT-ORIENTED COMPONENTS.

7.6 If after a period of time during which work has been completed in a Terminal WBS and the WBS Work User realizes that the scope of work is too much for his Center to complete in a timely manner. It will be necessary for him to discuss his situation with his respective project manager. Should both he and his project manager agree that it will be necessary to offload some or all of the work to an additional Center, the Work User needs to see to it that a child WBS is added with the offloading WBS being the Parent. While monies cannot be switched to an additional WBS, a parent-child relationship can exist. This allows for our financial application (SAP) to continue to collect monies at the original WBS level and allows us to offload work to another Center while not disrupting our audit trails.

8.0 STEPS

9.0 METRICS

10.0 OTHER DOCUMENTS, PROCEDURES OR FORMS RELEVANT TO THIS PROCEDURE

11.0 NECESSITY

11.1 There are many reasons why consistency and repeatability are necessary in project management and the following are provided to name a few:

11.1.1 They allow the breakdown of large complex projects into small management chunks (ideally, 5-15 work components).

11.1.2 They provide a single or uniform repository (i.e. category) for the work items.

11.1.3 They represent the build logic necessary to build a product, or perform a service.

11.1.4 They provide the basis for estimating and planning.

11.1.5 They provide a clear allocation of responsibilities for work, resources, and costs.

11.1.6 They provide a direct correlation from deliverables, to components, to work packages, to tasks, sub-tasks, costs, and schedules, for owners. All of which, allow functional management to focus on these topics as an integrated set at each level. (In other words, they provide a common denominator for management and other employees to design, develop, communicate, and to manage projects on a uniform basis.)

11.1.7 They create a plan hierarchy, which lends itself to multiple level management progress tracking, reporting and analysis.

11.1.8 The advantages of a common Work Breakdown Structure are manyfold, however, the following are those that immediately come to mind:

11.1.8.1 It makes it easier to plan.

11.1.8.2 It makes it easier to spot omissions and make changes.

11.1.8.3 It produces a hierarchical plan (prioritized plan) which lends itself to multiple level analysis and reporting.

11.1.8.4 It identifies prime responsibilities.

11.1.8.5 It identifies the product or sevices build logic.

12.0 QUALITY RECORDS

13.0 FORMS